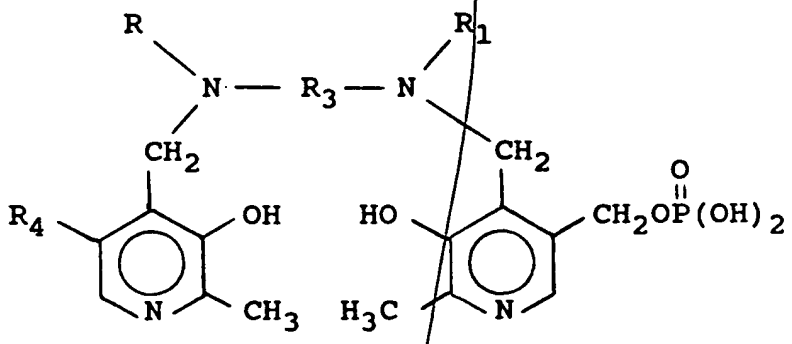
WE CLAIM:

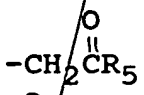
1. A chelating compound of the formula:



(I)

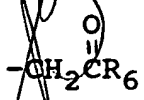
wherein

R is hydrogen or



;

R_1 is hydrogen or

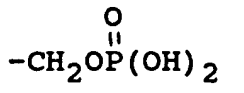


,

and one of R and R_1 is other than hydrogen;

R_3 is alkylene having from 1 to 8 carbons, 1,2-cycloalkylene having from 5 to 8 carbons, or 1,2-arylene having from 6 to 10 carbons, or

R_4 is hydrogen, hydroxymethyl, alkyl having from 1 to 6 carbons or



;

R_5 and R_6 are each, individually, hydroxy, alkoxy having from 1 to 18 carbons, hydroxy-substituted alkoxy having from 1 to 18 carbons, amino or alkylamido having from 1 to 18 carbons;

the phosphate group mono and diesters of the compounds thereof with monohydric and polyhydric alcohols having from 1 to 18 carbons, or alkylamino alcohols, each having from 1 to 18 carbons, and the salts thereof.

2. A chelate of Claim 1 wherein R is

$$-CH_2\overset{O}{\overset{\|}{C}}R_5$$

and R_1 is

$$-CH_2\overset{O}{\overset{\|}{C}}R_6 \quad .$$

3. A chelate of Claim 2 wherein R_5 and R_6 are each, individually, hydroxy, alkoxy having from 1 to 8 carbons, amino or alkylamido having from 1 to 8 carbons.

4. A chelate of Claim 3 wherein R_5 and R_6 are hydroxy or a salt thereof.

5. As a chelate of Claim 4, N,N'-bis-(pyridoxal-5-phosphate)ethylenediamine-N,N'-diacetic acid or a salt thereof.

6. A chelate of Claim 1 wherein R_3 is alkylene having from 2 to 6 carbons.

7. A chelate of Claim 1 wherein R_3 is cyclohexyl.

8. As a chelate of Claim 7, N,N'-bis-(pyridoxal-5-phosphate)-trans-1,2-cyclohexyl-diamine-N,N'-diacetic acid or a salt thereof.

Sub A'

9. A chelate of a compound of Claim 1, 2, 3, 4, 5, 6, 7, or 8 with a metal ion having an atomic number within the range of 21 to 29, 42, 44 or 58-70.

10. A chelate of Claim 9 wherein the metal ion is selected from the group consisting of chromium(III), manganese(II), iron(III), iron(II), cobalt(II), nickel(II), copper(II), praseodymium(III), neodymium(III), samarium(III), ytterbium(III), gadolinium(III), terbium(III), dysprosium(III), holmium(III) and erbium(III).

11. A calcium salt of a chelate of Claim 9.

12. A calcium salt of Claim 11 wherein the molar ratio of calcium to chelating compound is from 0.05 to 1.0.

13. A calcium salt of Claim 12 wherein the molar ratio of calcium to chelating compound is from 0.1 to 0.5.

Sub A2 14. A chelate of a compound of Claim 1, 2, 3, 4, 5, 6, 7, or 8 with a manganese(II) ion.

15. As a chelate of Claim 14, a manganese(II) chelate of N,N'-bis-(pyridoxal-5-phosphate)ethylenediamine-N,N'-diacetic acid or a salt thereof.

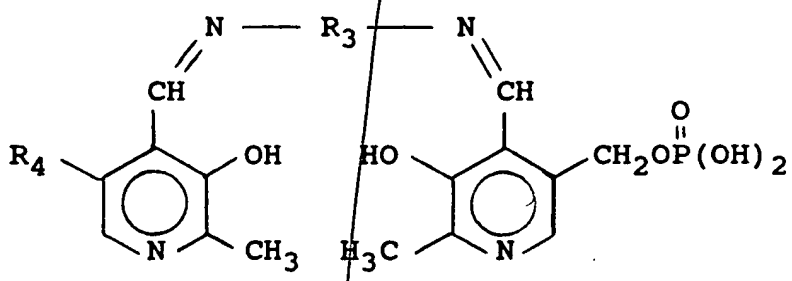
16. A calcium salt of the chelate of Claim 15.

17. A calcium salt of Claim 16 wherein the molar ratio of calcium to chelating compound is from 0.05 to 1.0.

18. A calcium salt of Claim 17 wherein the molar ratio of calcium to chelating compound is from 0.1 to 0.5.

19. As a chelate of Claim 14, a manganese(II) chelate of N,N'-bis-(pyridoxal-5-phosphate)-trans-1,2-cyclohexyl diamine-N,N'-diacetic acid or a salt thereof.

20. A chelating compound intermediate of the formula

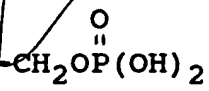


(VII)

wherein

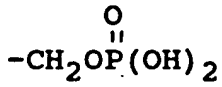
R_3 is alkylene having from 1 to 8 carbons or cycloalkyl having from 3 to 8 carbons;

R_4 is hydrogen, hydroxyalkyl having from 1 to 6 carbons, alkyl having from 1 to 6 carbons or



and the salts thereof.

21. A chelating compound intermediate of Claim 20 wherein R_4 is



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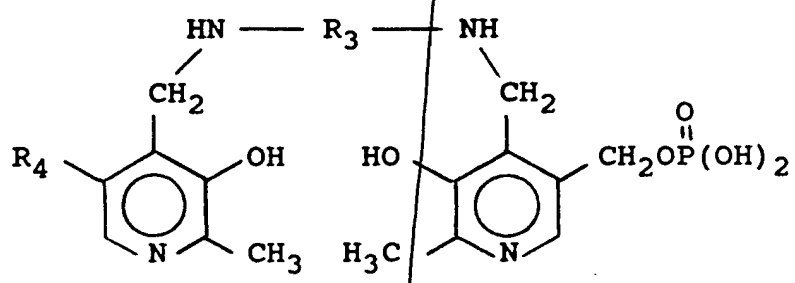
22. A chelating compound intermediate of Claim 21 wherein R_3 is an alkylene group having from 2 to 6 carbons.

23. A chelating compound intermediate of Claim 22 wherein R_3 is ethylene.

24. A chelating compound intermediate of Claim 21 wherein R_3 is 1,2-cycloalkylene.

25. A chelating compound intermediate of Claim 24 wherein R_3 is 1,2-cyclohexyl.

26. A chelating compound intermediate of the formula

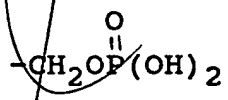


(VIII)

wherein

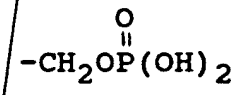
R_3 is alkylene having from 1 to 8 carbons or cycloalkyl having from 3 to 8 carbons;

R_4 is hydrogen, hydroxyalkyl having from 1 to 6 carbons, alkyl having from 1 to 6 carbons or



and the salts thereof.

27. A chelating compound intermediate of Claim 26 wherein R_4 is



and the salts thereof.

28. A chelating compound intermediate of Claim 26 wherein R_3 is an alkylene group having from 2 to 6 carbons.

29. A chelating compound intermediate of Claim 28 wherein R_3 is ethylene.

30. A chelating compound intermediate of Claim 26 wherein R_3 is 1,2-cycloalkylene.

31. A chelating compound intermediate of Claim 30 wherein R_3 is 1,2-cyclohexane.

32. A NMRI contrast medium composition consisting essentially of a chelate of a compound of Claim 1, 2, 3, 4, 5, 6, 7 or 8 with a metal ion having an atomic number of from 21-29, 42, 44 or 58-70 and a pharmaceutically acceptable, compatible excipient.

33. A NMRI contrast medium composition of Claim 32 wherein the metal ion is selected from the group consisting of chromium(III), manganese(II), iron(III), iron(II), cobalt(II), nickel(II), copper(II), praseodymium(III), neodymium(III), samarium(III), ytterbium(III), gadolinium(III), terbium(III), dysprosium(III), holmium(III) and erbium(III).

34. An NMRI contrast medium composition of Claim 33 containing a calcium salt of the chelate.

35. An NMRI contrast medium composition of Claim 34 containing containing a calcium salt of the chelate wherein the molar ratio of calcium to chelating compound is from 0.05 to 1.0.

36. An NMRI contrast medium composition of Claim 35 containing a calcium salt wherein the molar ratio of calcium to chelating compound is from 0.1 to 0.5.

37. An NMRI contrast medium composition of Claim 33 wherein the metal ion is manganese(II) ion.

38. An NMRI contrast medium composition of Claim 33 wherein the compound is N,N'-bis-(pyridoxal-5-phosphate)ethylenediamine-N,N'-diacetic acid, N,N'-bis-(pyridoxal-5-phosphate)-trans-1,2-cyclohexyl diamine-N,N'-diacetic acid, or a salt thereof.

39. An NMRI contrast medium composition of Claim 38 containing a calcium salt.

40. An NMRI contrast medium composition of Claim 39 containing a calcium salt, wherein the molar ratio of calcium to chelating compound is from 0.05 to 1.0.

41. An NMRI contrast medium composition of Claim 40 containing a calcium salt, wherein the molar ratio of calcium to chelating compound is from 0.1 to 0.5.

42. An NMRI contrast medium composition of Claim 33 wherein the concentration of chelate salt in the medium is from 0.001 to 5.0 moles per liter.

43. An NMRI contrast medium composition of Claim 42 wherein the concentration of chelate salt in the medium is from 0.1 to 0.5 moles per liter.

44. An improvement in the method of performing NMR imaging with a patient comprising administering to the patient, an effective amount of a chelate of a compound of Claim 1, 2, 3, 4, 5, 6, 7 or 8 with a metal ion having an atomic number of from 21-29, 42, 44 or 58-70.

45. An improvement in the method for performing NMR imaging of Claim 44 wherein the metal ion is selected from the group consisting of chromium(III), manganese(II), iron(III), iron(II), cobalt(II), nickel(II), copper(II), praseodymium(III), neodymium(III), samarium(III), ytterbium(III), gadolinium(III), terbium(III), dysprosium(III), holmium(III) and erbium(III).

46. An improvement in the method for performing NMR imaging of Claim 44 wherein the chelate of the compound is a calcium salt.

47. An improvement in the method for performing NMR imaging of Claim 46 wherein the molar ratio of calcium to chelate is from 0.05 to 1.0.

48. An improvement in the method for performing NMR imaging of Claim 47 wherein the molar ratio of calcium to chelate is from 0.1 to 0.5.

49. An improvement in the method for performing NMR imaging of Claim 44 wherein the the metal ion is manganese(II) ion.

50. An improvement in the method for performing NMR imaging of Claim 44 wherein the compound is N,N'-bis-(pyridoxal-5-phosphate)ethylenediamine-N,N'-diacetic acid, N,N'-bis-(pyridoxl)-5-phosphate)-trans-1,2-cyclohexyldiamine-N,N'-diaceti c acid, or a salt thereof.

51. An improvement in the method for performing NMR imaging of Claim 44 wherein the metal ion is manganese(II) and the compound is N,N'-bis-(pyridoxal-5-phosphate)ethylenediamine-N,N'-diacetic acid, N,N'-bis-(pyridoxl)-5-phosphate)-trans-1,2-cyclohexyldiamine-N,N'-diaceti c acid, or a salt thereof.

52. An improvement in the method for performing NMR imaging of Claim 51 wherein the salt is a calcium salt with a molar ratio of calcium to chelating compound of from 0.05 to 1.0.

53. An improvement in the method of performing NMR imaging of Claim 44 wherein from 0.001 to 5 mmole of chelate is administered per kg of patient body weight.

54. An improvement in the method of performing NMR imaging of Claim 53 wherein from 0.02 to 0.5 mmole of chelate is administered per kg of patient body weight.